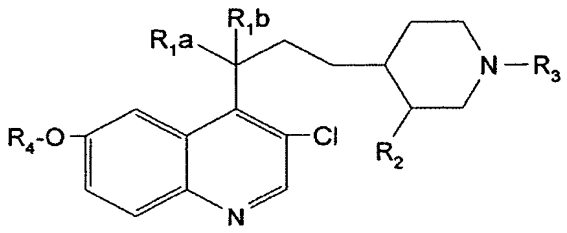
CLAIMS

1) A compound of the formula (I):



(I)

wherein:

R_{1a} is hydrogen, halogen, hydroxyl, amino, alkylamino, dialkylamino, hydroxyamino, alkoxyamino or alkylalkoxyamino; and

R_{1b} is hydrogen; or

R_{1a} and R_{1b} form an oxo group;

R_2 is carboxyl, carboxymethyl or hydroxymethyl;

R_3 is C_{1-6}alkyl substituted with phenylthio, C_{3-7}cycloalkylthio or 5- to 6-membered heteroarylthio; or propargyl substituted with phenyl, C_{3-7}cycloalkyl or 5- to 6-membered heteroaryl;

wherein said heteroaryl is having 1 to 4 heteroatoms chosen from nitrogen, oxygen and sulfur; and

wherein said phenyl or said heteroaryl is optionally substituted with one or more substituents selected from the group consisting of halogen, hydroxyl, alkyl, alkyloxy, trifluoromethyl, trifluoromethoxy, carboxyl, alkyloxycarbonyl, cyano and amino; and

wherein said cycloalkyl is optionally substituted with one or more substituents chosen from halogen and trifluoromethyl; and

R_4 is C_{1-6}alkyl, C_{2-6}alkenyl-CH_2- or C_{2-6}alkynyl-CH_2-, C_{3-8}cycloalkyl or C_{3-8}cycloalkylalkyl; or

an isomer, an enantiomer, a diastereoisomer or a mixture thereof, or a pharmaceutically acceptable salt thereof.

2) The compound as set forth in claim 1, wherein R_{1a} is hydroxyl and R_{1b} is hydrogen.

3) The compound as set forth in claim 1, wherein R_{1a} and R_{1b} form an oxo group.

4) The compound as set forth in claim 1, wherein R_4 is C_{1-6}alkyl.

5) The compound as set forth in claim 1, wherein R_2 is carboxyl.

6) The compound as set forth in claim 1, wherein R_3 is C_{1-6}alkyl substituted with an optionally substituted phenylthio, cycloalkylthio or heteroarylthio.

7) The compound as set forth in claim 6, wherein R_3 is ethyl substituted with thienylthio or phenylthio substituted with halogen or cyclohexylthio or cyclopentylthio.

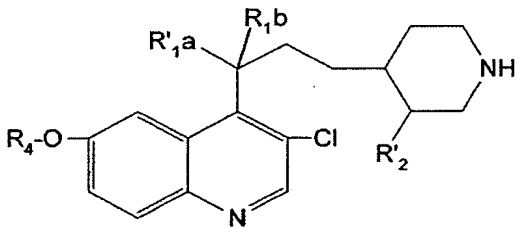
8) The compound as set forth in claim 1, which is selected from the group consisting of:

4-[3-hydroxy-3-(3-chloro-6-methoxyquinolin-4-yl)-propyl]-1-[2-(2,5-difluorophenyl-sulfanyl)ethyl]piperidine-3-carboxylic acid; and

4-[3-hydroxy-3-(3-chloro-6-methoxyquinolin-4-yl)-propyl]-1-[2-(2-thienylsulfanyl)ethyl]piperidine-3-carboxylic acid; or

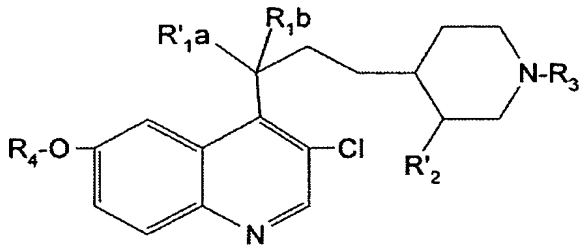
an isomer, an enantiomer, a diastereoisomer or a mixture thereof, or a pharmaceutically acceptable salt thereof.

9) A process for preparing a compound of formula (I) as set forth in claim 1 comprising condensing R_3-X with a compound of formula (II):



(II)

wherein R_4 is as defined in claim 1;
R'_{1a} is hydrogen or hydroxyl; and
R_{1b} is hydrogen; or
R'_{1a} and R_{1b} form an oxo group; and
R'_2 is protected carboxyl or carboxymethyl;
to obtain a compound of formula (III):



(III)

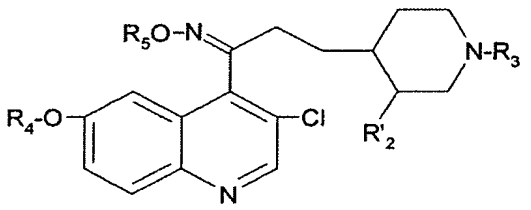
wherein R'_{1a}, R_{1b}, R'_2, R_3 and R_4 are as defined above; and optionally

treating the compound of formula (III) in which R'_{1a} is hydroxyl and R_{1b} is hydrogen with a halogenating agent; or optionally

oxidizing the compound of formula (III) in which R'_{1a} is hydroxyl and R_{1b} is hydrogen to an oxo group; and

converting said oxo group to hydroxyimino or alkoxyimino group;

to obtain a compound of formula (IV):



(IV)

wherein R'_2, R_3 and R_4 are as defined above; and R_5 is hydrogen or alkyl; and

reducing the compound of formula (IV) in which R_5 is hydrogen to the corresponding amine; and optionally,

alkylating said amine to a monoalkylated or dialkylated amine; or optionally

reducing the compound of formula (IV) in which R_5 is hydrogen to a hydroxylamine, or

reducing the compound of formula (IV) in which R_5 is an alkyl to an alkoxyamine; and optionally

alkylating said alkoxyamine to obtain the corresponding compound in which R_{1a} is alkylalkoxyamino; and

converting R'_2 to carboxyl or carboxymethyl; and optionally

reducing said carboxyl or protected carboxyl compound to hydroxymethyl compound; and optionally

converting said hydroxymethyl compound to carboxymethyl compound; and optionally

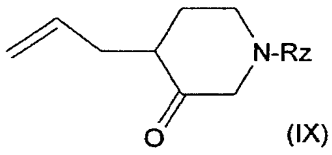
separating the isomers, and removing the acid-protecting group; and optionally

converting said compound to a suitable salt.

10) The process as set forth in claim 9, wherein the compound of formula (II), in which R'_{1a} is hydroxyl, is prepared by oxidation in a basic medium of a corresponding compound for which R'_{1a} and R_{1b} are hydrogen, the amine functional group of the piperidine is protected and R'_2 is as defined in claim 9.

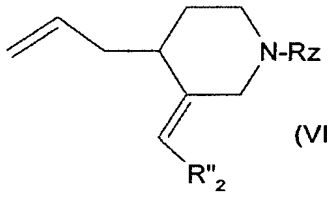
11) The process as set forth in claim 9, wherein the compound of formula (II) in which R'_{1a} and R_{1b} form an oxo group is prepared by oxidation of a corresponding compound of formula (II) in which R'_{1a} is a hydroxyl, which is obtained as described in claim 10.

12) The process as set forth in claim 9, wherein the compound of formula (II) in which R'_2 represents a protected carboxymethyl, and R'_{1a} and R_{1b} are hydrogen, is prepared by condensing a suitable phosphorous ylide with a compound of formula (IX):



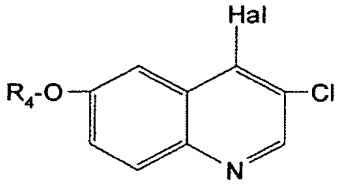
(IX)

wherein Rz is an amino-protecting group; to obtain a compound of formula (VIII):



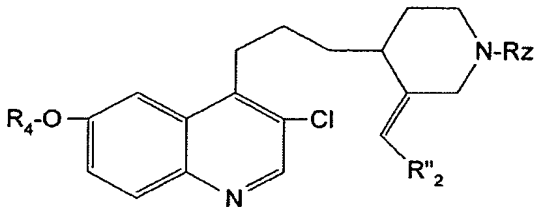
(VIII)

wherein Rz is as defined above and R''_2 is a protected carboxyl; and
condensing said compound of formula (VIII) with a compound of formula (VII):



(VII)

wherein R_4 is defined as in claim 1 and Hal represents an iodine or bromine atom;
to obtain a compound of formula (VI):

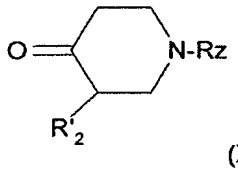


(VI)

wherein R''_2 and Rz are as defined above; and subjecting said compound of formula (VI) to a selective hydrogenation; and optionally deprotecting, where appropriate, the amino group of the piperidine.

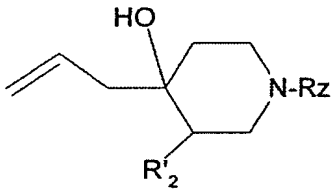
13) The process as set forth in claim 12, wherein the compound of formula (II) in which R'_2 is protected carboxyl is prepared by
subjecting a compound of formula (II) in which R'_2 is protected carboxymethyl to a reduction to obtain a compound of formula (II) in which R'_2 is hydroxyethyl;
converting said hydroxyethyl compound to a p-toluenesulfonyloxyethyl derivative; and
converting said derivative to a vinyl derivative by an elimination reaction; and
oxidizing said vinyl derivative and protecting thus obtained carboxyl to obtain compound of formula (II) in which R'_2 is protected carboxyl.

14) The process as set forth in claim 9, wherein the compound of formula (II), in which R'_{1a} and R_{1b} are hydrogen atoms, is prepared by allyation of the keto ester of general formula (XIV):



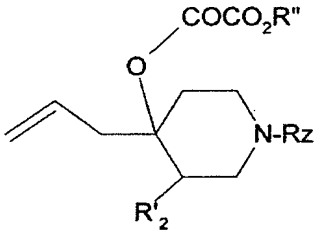
(XIV)

wherein R'_2 is as defined in claim 8 and Rz is as defined in claim 12, to obtain a derivative of general formula (XIII):



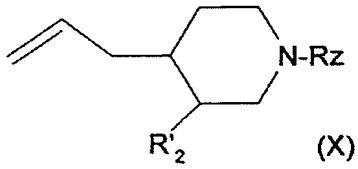
(XIII)

wherein R'_2 and Rz are as defined above, which is reacted with an alkyl oxalyl halide to obtain a derivative of general formula (XII):



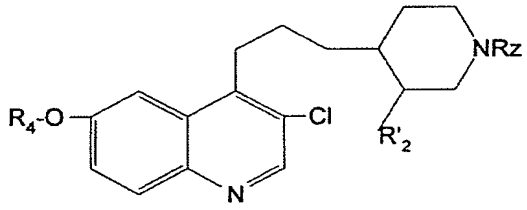
(XII)

wherein R" represents an alkyl and R'_2 and Rz are as defined above, which is subjected to a deoxygenation reaction, to obtain a derivative of general formula (X):



(X)

in which R'_2 and Rz are as defined above, which is condensed with a quinoline derivative of general formula (VII) as defined in claim 10, to obtain a derivative of general formula (XI):



(XI)

and then the amino-protecting radical Rz is removed.

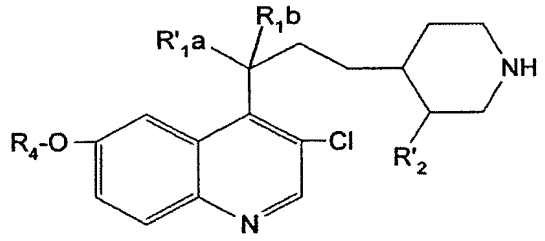
15) The process as set forth in claim 9 wherein the compound formed is 4-[3-hydroxy-3-(3-chloro-6-methoxyquinolin-4-yl)-propyl]-1-[2-(2,5-difluoro-phenylsulfanyl)ethyl]piperidine-3-carboxylic acid.

16) The process as set forth in claim 9 wherein the compound formed is 4-[3-hydroxy-3-(3-chloro-6-methoxyquinolin-4-yl)-propyl]-1-[2-(2-thienylsulfanyl)ethyl]piperidine-3-carboxylic acid.

17) A pharmaceutical composition comprising therapeutically effective amount of a compound of formula (I) as set forth in claim 1 or a pharmaceutically acceptable salt thereof in

combination with a pharmaceutically acceptable carrier.

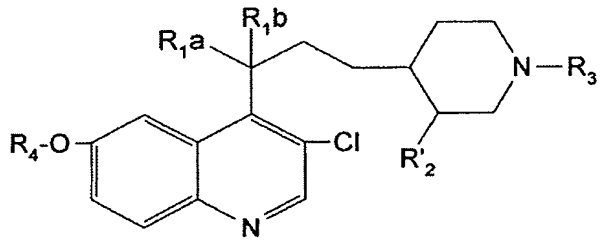
18) A compound of formula (II):



(II)

wherein R_4 is as defined in claim 1, either R'_{1a} is hydrogen or hydroxyl and R_{1b} is hydrogen or R'_{1a} and R_{1b} form an oxo group and R'_2 is protected carboxyl or carboxymethyl.

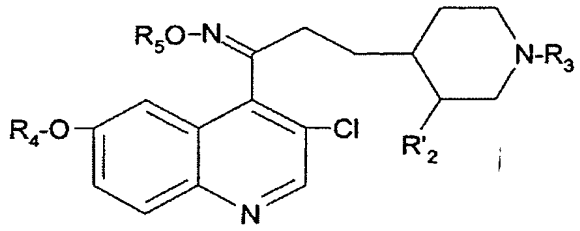
19) A compound of formula (A):



(A)

wherein R_{1a}, R_{1b}, R_3 and R_4 are as defined in claim 1 and R'_2 is protected carboxyl or carboxymethyl.

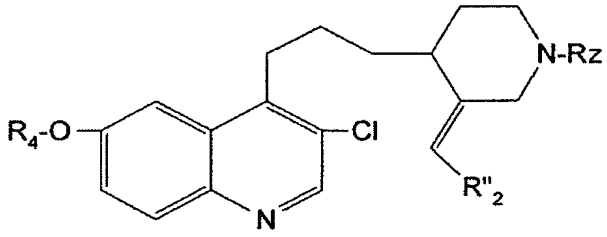
20) A compound of formula (IV):



(IV)

wherein R_3 and R_4 are as defined in claim 1 and R'_2 is protected carboxyl or carboxymethyl and R_5 is hydrogen or alkyl.

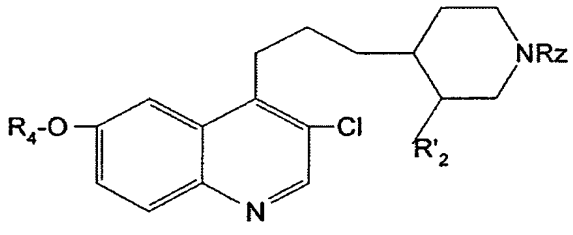
21) A compound of formula (VI):



(VI)

wherein R_4 is as defined in claim 1 and R''_2 is protected carboxyl and Rz is an amino-protecting group.

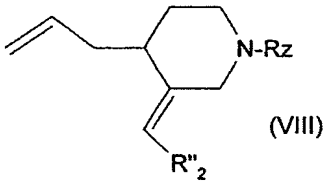
22) A compound of formula (XI):



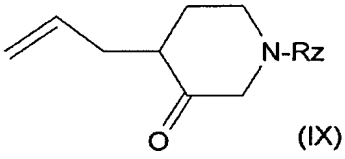
(XI)

wherein R_4 is as defined in claim 1, R'_2 is protected carboxyl or carboxymethyl and Rz is an amino-protecting group.

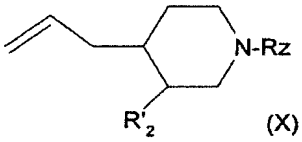
23) A compound of formulae:



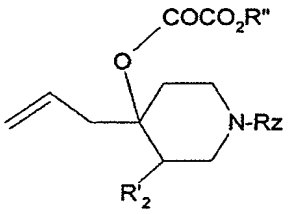
(VIII)



(IX)

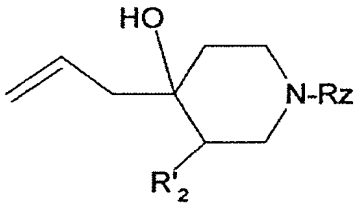


(X)



(XII)

or



(XIII)

wherein R'_2 is as defined in claim 9 and R''_2 and Rz are as defined in claim 12.

24) A method of treatment of a bacterial infection in a patient comprising administering to said patient a therapeutically effective amount of a compound of formula (I) as set forth in claim 1 or a pharmaceutically acceptable salt thereof.

25) The method as set forth in claim 24 wherein said bacterial infection is caused by gram (+) bacteria.

26) The method as set forth in claim 24 wherein said

bacterial infection is staphylococcic infection.

27) The method as set forth in claim 23 wherein said staphylococcic infection is selected from the group consisting of staphylococcal septicemias, malignant staphylococcic infections of the face or skin, pyoderma, septic or suppurant wounds, anthrax, phlegmons, erysipelas, acute primary or post-influenza staphylococcic infections, bronchopneumonias and pulmonary suppurations.

28) The method as set forth in claim 23 wherein said bacterial infection is colibacilloses and related infections, proteus infection, klebsiella infection, salmonella infection, and infection caused by gram (-) bacteria.